



THE OFFICIAL TEXAS HURRICANE GUIDE

Southeast Texas Edition

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Coastal Guardians Outreach

Remembering Carla

50 YEARS LATER



Bert Charan, Ayna Sehgal, Patrick Vaughn



12 NEWS NOW.com



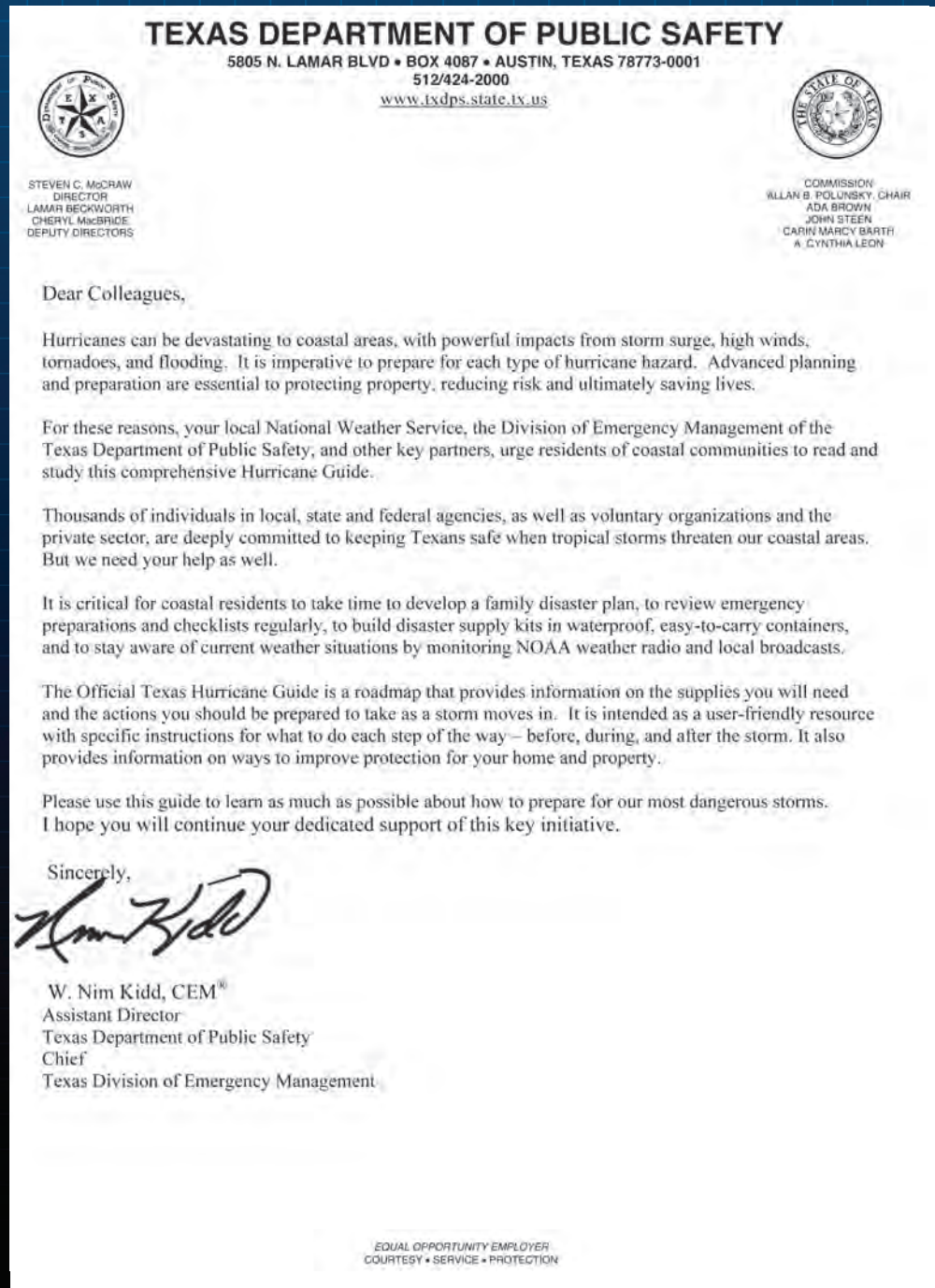
All the information you need for hurricane season

Introduction

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About the Hurricane



Since 1851, 63 hurricanes have struck the Texas coast. That is **one every three years** on average.

Hurricanes form over warm ocean waters, like those found in the Gulf of Mexico. The hurricane season starts June 1 and ends November 30. The peak threat for the Texas coast exists from August through September. However, hurricanes can and have struck the Texas coast during every month of the hurricane season.

Left: High resolution satellite image of Hurricane Ike over the northwest Gulf of Mexico. Image--NASA


Below: Historical perspective of hurricane landfalls in Texas since 1851.



Definitions to Know

L TROPICAL DEPRESSION: An organized system of persistent clouds and thunderstorms with a closed low-level circulation and maximum winds of 38 mph or less.

 **TROPICAL STORM:** An organized system of strong thunderstorms with a well defined circulation and maximum sustained winds of 39 to 73 mph.

 **HURRICANE:** An intense tropical weather system with a well defined circulation and sustained winds of 74 mph or higher.

TROPICAL CYCLONE: A general term used to describe a tropical depression, tropical storm, or hurricane.

HURRICANE/TROPICAL STORM WATCH:
Hurricane or Tropical Storm conditions are possible in the watch area within 48 hours.

HURRICANE/TROPICAL STORM WARNING:
Hurricane or Tropical Storm conditions are possible in the warning area within 36 hours.

Storm Surge

STORM SURGE is the abnormal rise in sea level before, during, and even after a tropical storm or hurricane approaches and/or makes landfall.

Historically, storm surge used to claim 9 out of 10 lives. Over the last several decades, advancements in the science of hurricane forecasting and communications have lead to a marked decrease in this number. However, Katrina was a grim reminder that certain areas are still very susceptible to storm surge fatalities.

Storm surge is extremely destructive to anything in it's path, especially if the surge comes in with a significant speed. This is because water is extremely heavy. A cubic yard of water weighs nearly 1700 pounds! Remember, there is a reason why large steel ships and barges float.

The height of the storm surge depends on the size and strength of the tropical cyclone. The larger and/or stronger the storm, the higher the storm surge. However, this is not the only factor that affects the height of the storm surge. The shape and slope of the continental shelf across the coastal waters is another big factor in determining the height of the storm surge.

For example, a hurricane with 100 mph sustained winds (a category two) strikes the Southeast Florida Coast. Since this area of Florida has a steep continental shelf, the storm surge is only around 4-5 feet (illustrated in figures 1a & 1b below). Now if this hurricane with the exact same size and strength made landfall across the Upper Texas coast, the storm surge could be in the 9-10 foot range (illustrated in figures 2a & 2b below). This is due to the shallow continental shelf that extends over a hundred miles offshore, which typically piles the water higher and creates higher waves.

As the illustrations show below, this made the difference between very little surge entering the beach house across the Southeast Florida Coast and the complete destruction of the beach house across the Upper Texas Coast.

1a



Beach house along the southeast Florida coast before hurricane landfall.

1b



The 4-5 foot storm surge barely inundates the house.

2a



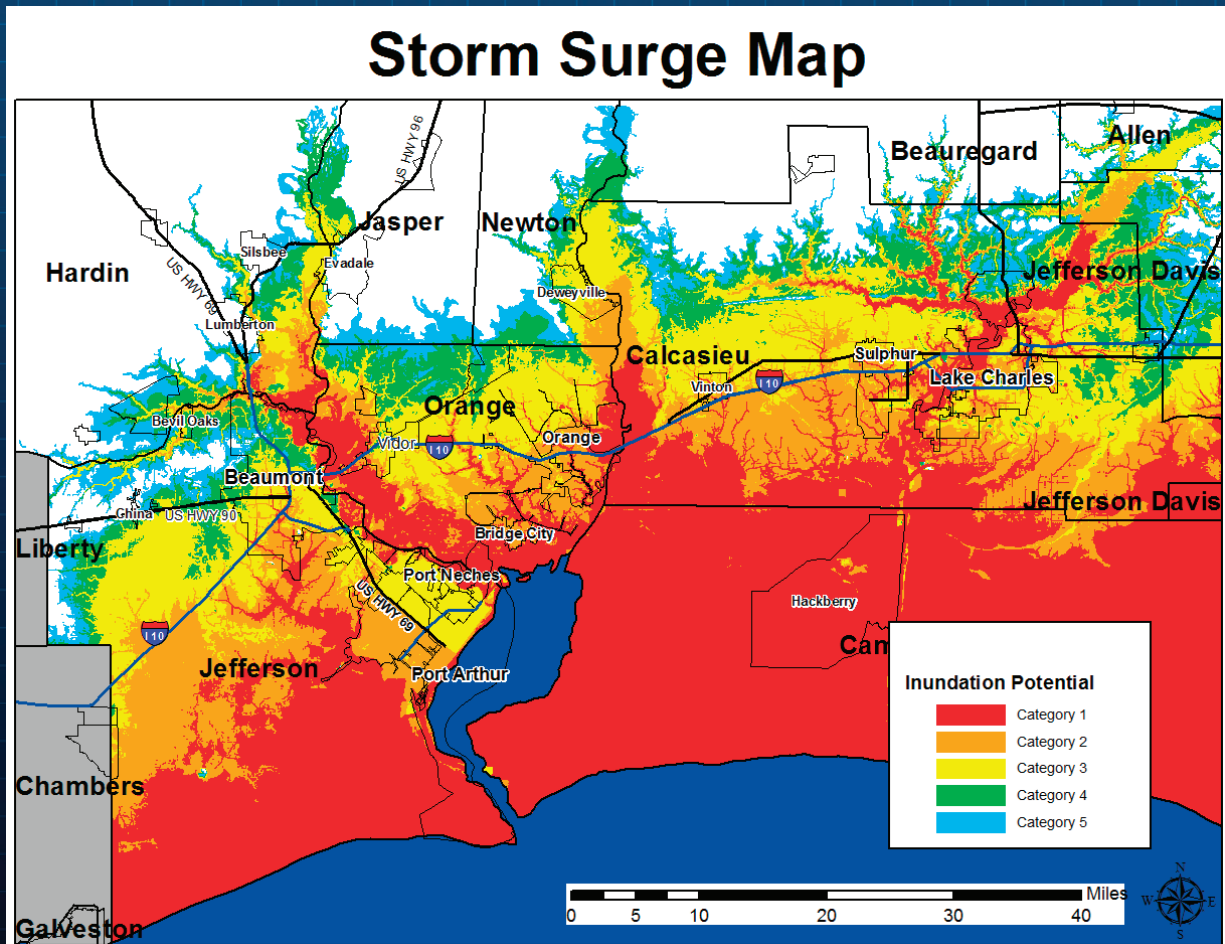
Beach house along the upper Texas coast before hurricane landfall.

2b



The 9-10 foot storm surge and crashing waves completely destroys the house.

Storm Surge



Hurricane Ike will long be remembered as one of the most devastating storm surge hurricanes to affect the Upper Texas Coast within the last 150 years of records. Over the warm waters of the Gulf of Mexico, Ike grew in size and intensified to a category two hurricane with maximum winds of 100 mph. The hurricane crossed the central and northwest Gulf of Mexico as it tracked towards the Upper Texas coast. Although Ike's intensity remained in the category 2 range, the cyclone continued to grow and became a very large and dangerous hurricane. Aircraft Reconnaissance measured Ike's tropical storm wind swath to be approximately 450 miles wide, with a hurricane force wind swath of 180 miles. Hours before landfall, Ike's structure began getting better organized with an eye evident. Ike made landfall on Galveston Island at 2:00 AM CDT September 13th as a strong category 2 based on 110 mph sustained winds and a central pressure of 950 mb.

The combination of Ike's large wind swath, and the fact that this wind swath piled water over the shallowest portion of the Gulf, lead to much higher than normal storm surge flooding along the Upper Texas Coast. Storm surge levels reached 18-19 feet near and southeast of High Island and along the coast of southwest Jefferson County. A 14-15 foot storm surge occurs at Sabine Pass resulting in the highest water level ever record at that location. Any structure that was not elevated was destroyed. Even homes that were elevated received water damage due to high waves on top of the storm surge.

Storm Surge

The storm surge did not top the seawall around Port Arthur which was 14.5 to 17 feet high. However, wave action on top of the storm surge did push some water over the seawall. Storm surge backed up the Neches River near Beaumont and flooded homes north of I-10 near the river. Many underpasses were flooded across Beaumont resulting in standing water over 10 feet deep in places. A storm surge as high as 10 to 12 feet reached Bridge City and downtown Orange, resulting in water as deep as 9 feet on the roads on the east side of town.

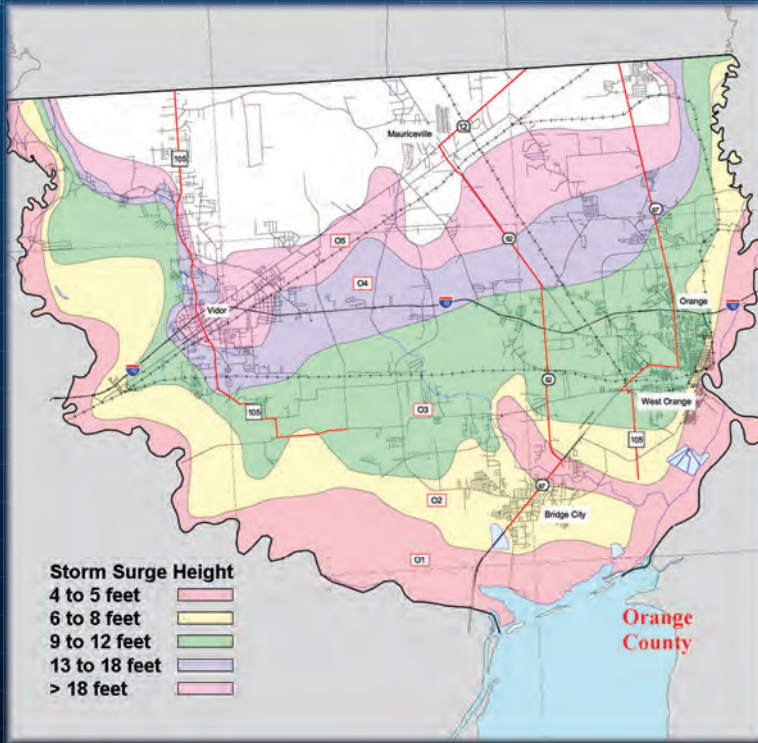
In total, at least 4000 homes in the Hamshire, Fannett, Sabine Pass, and Northeast Beaumont were flooded. Over 5000 homes from Bridge City to Rose City had water damage. Over 3000 homes in the city of Orange and surrounding areas had water enter them. Many water rescues occurred in Bridge City, West Orange, and downtown Orange.



Above: A before and after aerial photo of Gilchrist, TX. The top photo was taken on January 15, 2006 and the bottom photo on September 14, 2008 after the passage of Hurricane Ike.

Inundation Maps

Orange County

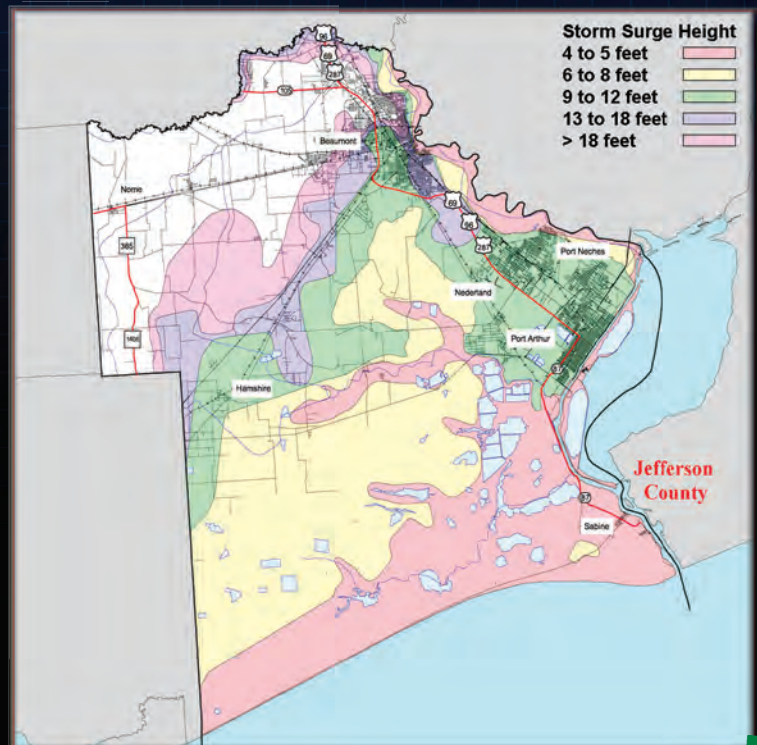


These storm surge inundation maps show the projected inland penetration of water based on the forecast storm surge. Areas located along the immediate coast in the pink and yellow colors have the greatest danger and are susceptible to storm surges of as little as 4 feet.

“The greatest potential for loss of life related to a hurricane is from the storm surge.”

- National Hurricane Center

Jefferson County



Flooding and Tornadoes

Inland Flooding



There are numerous examples of devastating inland flooding caused by land-falling tropical cyclones in Texas. 2011 marks the tenth anniversary of the landfall of Tropical Storm Allison, which came ashore along the Upper Texas coast on June 5, 2001. Rainfall totals of 15 to 27 inches in two different episodes produced devastating flooding across far Eastern Texas as well as Southern Louisiana. 19 of the 22 deaths attributed to Allison, as well as many of the emergency rescues, were related to persons driving or walking through flood waters.

Five Practical Ways to Protect Yourself and Others From the Dangers of Inland Flooding

- **Protect Your Past – The 15-Minute Rule: A Focus on Personal Records and Special Items**
 - ✓ You should be able to secure and move all your valuables within 15 minutes
 - ✓ Store valuables – pictures, important documents, or collectibles – in plastic tubs with locking tops
- **Protect Your Present – Buy Flood Insurance: A Focus on Replaceable Items**
 - ✓ The National Flood Insurance Program (NFIP) is available from an insurance agent or the NFIP
 - ✓ For more information see <http://www.fema.gov/about/programs/nfip/index.shtm>
- **Protect Your Future – Flood Proof Your Home: A Focus on Minimizing Flooding Impacts**
 - ✓ Shut off the main circuit breaker to prevent short circuiting and eliminate the threat of electrocution
 - ✓ Raise outside air conditioning units onto platforms above ground level
 - ✓ Store rarely used or expensive items in the attic or on high shelves
- **Protect Your Peace of Mind – Save Your Life: A Focus on Planning and Communication**
 - ✓ Develop a plan of action to keep from panicking or withdrawing during an emergency
 - ✓ Battery powered radios or televisions can be used in the event of a power outage
 - ✓ Plan an evacuation route and alternatives in case your primary route is blocked
- **Protect Yourself and Others – Never Drive on Flooded Roads: “Turn Around, Don’t Drown!”**
 - ✓ Driving into flooded roadways puts your life and the lives of others at risk
 - ✓ Unless told to evacuate, you are probably safest staying at your current location
 - ✓ **If you encounter flood waters when driving, Turn Around, Don’t Drown!**

Tornadoes

Tropical cyclones also produce tornadoes. These tornadoes most often occur in thunderstorms embedded in rain bands well away from the center of the hurricane; however, they can also occur near the eyewall. Tornadoes produced by tropical cyclones are relatively weak and short-lived, but still pose a threat.



Destructive Winds



Above: Wind damage to a billboard from Hurricane Lili in October 2002.

Hurricane force winds of 74 mph or more can destroy buildings, mobile homes, trees and power poles. Debris such as signs, roofing material, siding, and small items left outside become flying missiles in a hurricane. The strongest winds occur in a region of the hurricane called the eyewall. Wind gusts in the right side of the eyewall are the most destructive. Hurricane force winds can be felt as far as 150 miles from the coast.

It is imperative to ensure your home or business is well constructed to minimize the damage from the wind. See the Planning and Preparing section in this guide for cost effective home improvement tips that can help you reduce your damage from a hurricane.



MOBILE HOME RESIDENTS MUST EVACUATE!

- No mobile home or manufactured home - no matter how new it is - can provide safe shelter from hurricane force winds.
- Straps or other tie-downs **will not** protect a mobile home from the high winds associated with a hurricane.
- Mobile home residents **must evacuate** when told to do so by local authorities.



Saffir Simpson Hurricane Wind Scale



- | | | | |
|--------------|----------------------|--------------|----------------------------|
| ● Category 1 | Winds 74 to 95 mph | ● Category 4 | Winds 131 to 155 mph |
| ● Category 2 | Winds 96 to 110 mph | ● Category 5 | Winds greater than 155 mph |
| ● Category 3 | Winds 111 to 130 mph | | |

Planning and Preparing

Preparing Your Home Before the Storm

Proper hurricane preparations made ahead of time will not completely protect your property from damage. However, following a few simple tips may greatly reduce the damage to your home and property.

Right: Hurricane clips attaching roof trusses to side walls.



Important Home Preparation Tips

Elevation Matters

- Know the elevation of your home! Are you in a flood and/or evacuation zone?

Mobile Homes

- Check tie-downs for rust or breakage.
- Residents of mobile homes must evacuate when told to do so!!

Landscaping

- Trim trees, shrubbery and dead limbs, especially ones close to your home.
- Repair or replace broken or damaged fences.
- Shredded bark is preferred instead of small gravel or stone bedding.

Roofing

- Inspect the roof for loose tiles, shingles or debris. Consider replacing old or damaged shingles with new ones rated for hurricane force winds.
- Check for and/or install hurricane clips to secure roof trusses to side walls.
- Clear loose and clogged rain gutters and downspouts.

Doors

- Reinforce garage doors and tracks or replace with a hurricane tested door. (See above image)
- Reinforce double entry doors with heavy duty foot and head bolts.
- Use a security dead bolt with a one inch minimum bolt length.
- Doors may be shuttered, but one entry must be left easily accessible.

Windows

- If possible, install tested/manufactured hurricane shutters.
- Inspect existing shutters to ensure they are in good working order.
- Alternative: Use 5/8" or greater exterior grade plywood secured by 2 1/2" screws and/or special clips. Obtain wood and fasteners, cut wood to size, pre-drill holes and place anchors on homes.
- Store shutters or plywood lying flat to avoid warping when not in use.

Planning and Preparing

Business and Employee Preparation



Tips for Businesses

- Establish a temporary location for business operations in case your facility is damaged.
- Give employees enough time to secure their homes and families.
- Consider paying employees before they leave to prepare their homes.
- Identify and protect vital records. Backup and store key files off site.
- Protect electronic equipment from possible water damage.
- Have extra cash and blank checks in case extra money is needed after the storm.
- Identify a safe room for employees who must remain in the building.
- Develop a 24-hour emergency contact with phone numbers of key employees.
- Set up telephone numbers for employees to check in and receive company information.

Protecting Your Boat - Marine Preparations



Tips for Boat Owners

- Check your marina contract for policies and procedures for hurricanes.
- Check with the manufacturer for proper ways to secure your boat during a storm.
- Consider moving arrangements well in advance of an approaching storm.
- Trailer boats should be removed from the water and securely stored at least 48 hours before a hurricane is expected to make landfall.
- Purchase necessary hurricane materials such as additional mooring lines, crew anchors, fenders, fender boards, chafing gear, and anchors.
- Safe storm moorings should consist of good condition ropes of sufficient diameter and length, with at least three or four substantial anchor points.
- Do not moor parallel to bank. Receding tides often capsize boats in this type of anchorage.

Special Needs

General Preparations for People With Special Needs



FEMA News Photo

Preparation in advance of hurricane season is essential, especially for people with special needs. It is essential that a destination is identified ahead of time that can accommodate people with special needs. Shelters should be considered as a **last resort** when people with special needs evacuate because many shelters cannot provide the attention required. Assisting elderly neighbors and acquaintances with pre-hurricane preparations is encouraged.



Important Special Needs Tips

- Identify with whom you will stay in the event an evacuation becomes necessary.
- Make arrangements for transportation in the event you evacuate. Make sure your transportation can accommodate any equipment or other supplies that need to be taken with you.
- Make sure you have the following items that should be stored in advance:
 - ✓ Extra copies of your prescriptions in case your physician's office is damaged and not operational.
 - ✓ At least a 1 month supply of medications.
 - ✓ Identification.



Transportation Assistance Registry

If you will need help evacuating when a hurricane threatens, dial 2-1-1 to register in advance for a ride

Dial 2-1-1 as soon as possible:

- Do not wait until a hurricane forms in the Gulf
- If you cannot drive and cannot arrange transportation
- If you have a disability or special health care need and require assistance to get out
- If you do not have a vehicle and you have no one else to help you evacuate

Is someone going to pick me up or call me when a hurricane threatens?

Emergency evacuations are handled different in every community. When a major hurricane threatens, local emergency managers will make every attempt to evacuate someone who does not have the ability to evacuate themselves, if there is enough time to do so safely. Once a hurricane enters the Gulf, individuals should pay close attention to local media to determine when and how evacuations will occur.

Pets and Livestock

Preparing for Your Pet's Safety

Your pet should be part of your overall hurricane preparation plans. Below are a few important things to help you prepare:

- Make sure your pet's vaccinations are current and have proof they are current. **DO NOT** assume that a public shelter or hotel will accept your pet.
- Be sure to have a current photo of your pet.
- Each animal should have a properly sized pet carrier. The carrier should be large enough for the animal to stand up and turn around.
- Make sure your pet has a proper ID collar.
- Pack enough food and bottled water for the duration of your evacuation. **DO NOT** let your pet eat food or drink water from outside that may have become contaminated.
- Be sure to pack all medications your pet may need along with a muzzle, collar, leash, paper towels, and trash bags.



Preparations for Livestock



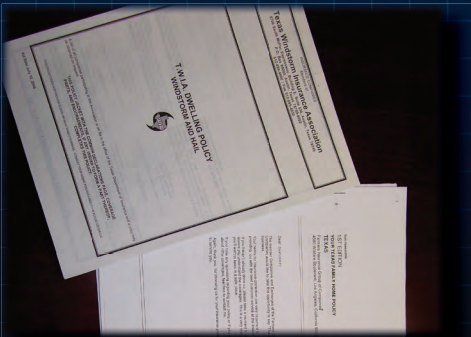
- Ensure all animals have some form of visible identification.
- Evacuate animals whenever possible. Arrangements for evacuation, including routes and host sites should be made in advance.
- The evacuation sites should have or be able to readily obtain food, water, veterinary care, handling equipment and facilities.
- Obtain vehicles and trailers needed for transporting each type of animal. Also make available experienced handlers and drivers.

- If evacuation is not possible, a decision must be made whether to move large animals to available shelter or turn them outside. This decision should be determined based on soundness and location of the shelter (structure).
- When necessary, move livestock to higher ground and deny access to flood prone pastures, barns, and other structures.
- It is important that livestock have plenty of food and clean water.

Insurance Tips

Insurance Tips - Before the Storm

- When shopping for insurance, get quotes from different companies and consider financial strength and history of complaints from each company.
- Ask agents for discounts if available.
- New and existing policies **will not be written or modified** when a storm nears the Gulf of Mexico.
- Make sure you fully understand what perils are covered and excluded in your policy.
- Make sure your coverage is adequate to replace your home and contents in today's dollar.
- Determine whether your policy covers additional living expenses for a temporary residence if you are unable to live in your home because of damage from a disaster.
- **DO NOT** cancel an old policy until you have a new policy in effect.
- Before hurricane season, prepare detailed written and/or photographic inventory of your home's contents and store it in a safe place with your policy.
- If you evacuate or choose to leave your home for safety, make sure to take the written and photo inventory with you, as well as all insurance policies (auto, home, life, etc.)
- If your insurance company does not cover flood or windstorm perils, ask about coverage through the Texas Windstorm Insurance Association or the National Flood Insurance Program.



Important Web Information

National Flood Insurance Program

www.floodsmart.gov

Texas Windstorm Insurance Association

www.twia.org

Texas Department of Insurance

www.tdi.state.tx.us/consumer

1-800-252-3539 (Consumer Help Line)

Insurance Tips - After the Storm

- Give prompt written notice to your insurance company.
- If you cannot be easily contacted, give your insurance company the contact information of a trusted friend or relative who can reach you if necessary.
- Photograph or videotape damaged structures and all damaged property. Make a list of damaged or lost items.
- **DO NOT** throw out damaged property before your adjuster has inspected the debris unless it is a health hazard or impedes local cleanup.
- Protect your property from further damage.
- Keep an accurate record of temporary repair and living expenses if a loss of use is suffered.
- Along with insurance adjuster estimate for repairs to home, obtain two or more contractor estimates. Estimates must be broken down per line item.
- Claim advancements are made to the policy holder for home repairs, personal property and living expenses. Final payments are made only after completed repairs and adjuster review.

Contact Info/Supply Kit

The Beaumont Chapter of the American Red Cross recommends that you have the following items in your Hurricane Supply Kit. Do not forget to have a family meeting before hurricane season and review your communication information and evacuation plan. Make sure the contact information such as home, work, school, cell phone numbers, and your "Out of Town" contact person's information is current.



Emergency Contact Information

Out of Town Contact Address:

Out of Town Contact Phone Number:

Work Telephone Number:

Cell Number/Spouse Cell Number:

Children Cell Number:

School Telephone Number:

Doctor Telephone Number:

Bank/Credit Card Telephone Number:

Insurance Company Information:



HURRICANE SUPPLY KIT



- At least a 7-day supply of non-perishable food and a manual can opener
- At least a 7-day supply of water. One gallon per person per day is recommended
- Battery powered portable television or radio with extra batteries
- Flashlight with extra batteries
- First Aid kit and manual
- Sanitation and hygiene items such as instant hand sanitizing gel, moist towelettes, toilet paper, and feminine hygiene products
- Matches in a waterproof container
- Whistle
- Kitchen accessories and cooking utensils
- Cash
- Extra clothing, blankets, and sleeping bags
- Photocopies of identification, insurance, prescriptions, household inventory, credit cards, and your latest utility bill
- CD or photocopies of important documents such as birth/marriage certificates and titles
- Prescription medications, eyeglasses, contact lens solution, and hearing aid batteries
- Formula, baby food, diapers, and pacifiers
- Pet carriers, leashes, shot records, and food for each animal evacuating with you
- A good map showing county roads and highways
- Tire repair kit, booster cables, pump, and flares
- White distress flag
- Toys and games for children
- List of family phone numbers and addresses outside the area

Bert Charan

Ayna Sehgal

Patrick Vaughn

Hurricane Names

2011

- | | |
|-----------------------------------|-----------------------------------|
| <input type="checkbox"/> Arlene | <input type="checkbox"/> Lee |
| <input type="checkbox"/> Bret | <input type="checkbox"/> Maria |
| <input type="checkbox"/> Cindy | <input type="checkbox"/> Nate |
| <input type="checkbox"/> Don | <input type="checkbox"/> Ophelia |
| <input type="checkbox"/> Emily | <input type="checkbox"/> Philippe |
| <input type="checkbox"/> Franklin | <input type="checkbox"/> Rina |
| <input type="checkbox"/> Gert | <input type="checkbox"/> Sean |
| <input type="checkbox"/> Harvey | <input type="checkbox"/> Tammy |
| <input type="checkbox"/> Irene | <input type="checkbox"/> Vince |
| <input type="checkbox"/> Jose | <input type="checkbox"/> Whitney |
| <input type="checkbox"/> Katia | |

2012

- | | |
|-----------------------------------|----------------------------------|
| <input type="checkbox"/> Alberto | <input type="checkbox"/> Leslie |
| <input type="checkbox"/> Beryl | <input type="checkbox"/> Michael |
| <input type="checkbox"/> Chris | <input type="checkbox"/> Nadine |
| <input type="checkbox"/> Debby | <input type="checkbox"/> Oscar |
| <input type="checkbox"/> Ernesto | <input type="checkbox"/> Patty |
| <input type="checkbox"/> Florence | <input type="checkbox"/> Rafael |
| <input type="checkbox"/> Gordon | <input type="checkbox"/> Sandy |
| <input type="checkbox"/> Helene | <input type="checkbox"/> Tony |
| <input type="checkbox"/> Isaac | <input type="checkbox"/> Valerie |
| <input type="checkbox"/> Joyce | <input type="checkbox"/> William |
| <input type="checkbox"/> Kirk | |

2013

- | | |
|------------------------------------|------------------------------------|
| <input type="checkbox"/> Andrea | <input type="checkbox"/> Lorenzo |
| <input type="checkbox"/> Barry | <input type="checkbox"/> Melissa |
| <input type="checkbox"/> Chantal | <input type="checkbox"/> Nestor |
| <input type="checkbox"/> Dorian | <input type="checkbox"/> Olga |
| <input type="checkbox"/> Erin | <input type="checkbox"/> Pablo |
| <input type="checkbox"/> Fernand | <input type="checkbox"/> Rebekah |
| <input type="checkbox"/> Gabrielle | <input type="checkbox"/> Sebastien |
| <input type="checkbox"/> Humberto | <input type="checkbox"/> Tanya |
| <input type="checkbox"/> Ingrid | <input type="checkbox"/> Van |
| <input type="checkbox"/> Jerry | <input type="checkbox"/> Wendy |
| <input type="checkbox"/> Karen | |

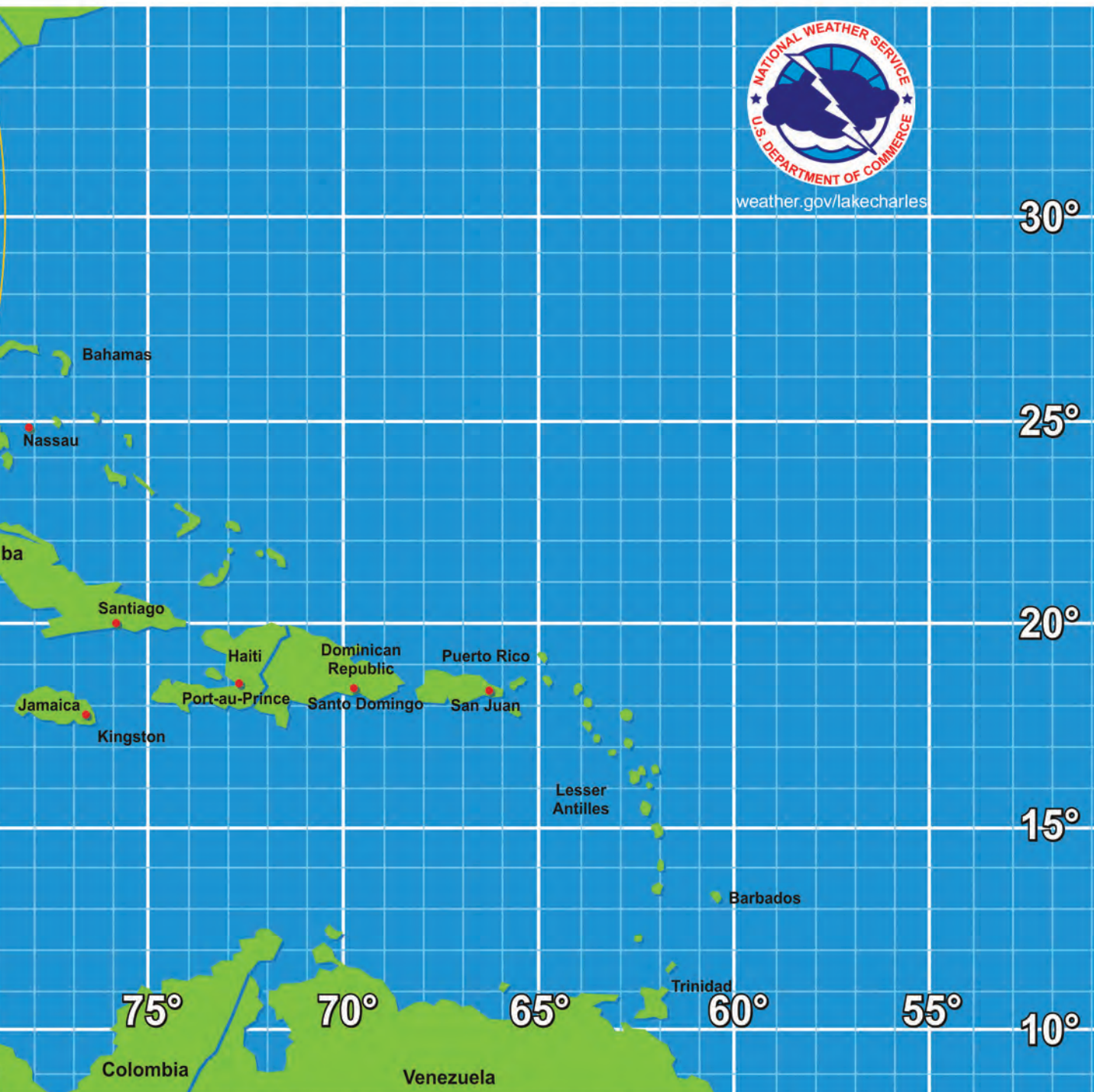


This chart is marked with vertical (longitude) and horizontal (latitude) lines, each representing 1 degree. A storm's position is given in these degrees.



THE OFFICIAL TEXAS

Hurricane Tracking Chart



weather.gov/lakecharles

30°

25°

20°

15°

10°

75°

70°

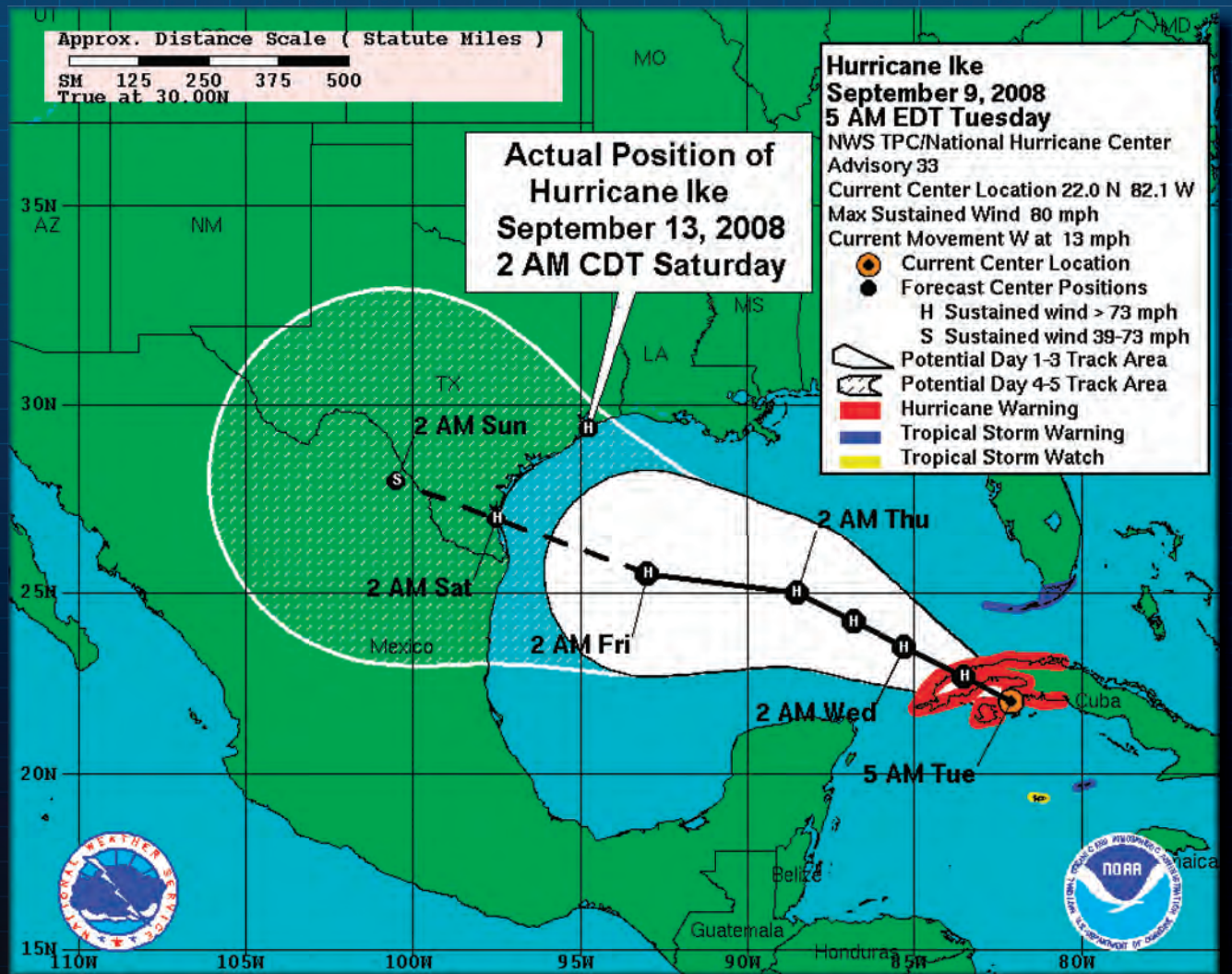
65°

60°

55°

es. Find the given longitudinal number at the bottom of the chart. Follow it up where it intersects with the given latitudinal line. Place a mark on the intersection point (this is the hurricane's current position).

Hurricane Forecasts



Don't Focus on the Skinny Black Line!!

Weather forecasting has never been and will likely never be an exact science. Thus, the ability to forecast the exact track and intensity of a hurricane will always present a challenge for forecasters and users of the forecasts to make critical evacuation decisions. In the figure below, the "skinny black line" represents the forecast track of highest confidence. However, one must not just focus on the skinny black line, but rather focus on the potential area the hurricane could affect, as illustrated by the white and hatched areas around the forecast track. This area, known as the "cone of uncertainty," represents the average track errors during the last five years. Fortunately, track forecasting has improved over the last several decades. Unfortunately, intensity forecasting has not shown much increase in accuracy over the same time period.

The forecast graphic above illustrates why users of the hurricane forecast must take into consideration the "cone of uncertainty."

Final Checklists

Actions to Take When a Storm is in the Gulf

- Listen frequently to radio, TV, or NOAA weather radio for bulletins and forecasts of the storm's progress.
- Double check items in your emergency supply kit.
- Fuel and service your vehicles.
- Inspect and secure mobile home tie-downs.
- Make sure you have supplies to survive on your own for at least one week if you plan on staying.
- Board up windows (if shutters do not exist) in case storm moves quickly and you have to leave.
TAPE PROVIDES NO PROTECTION!
- Store lawn furniture and other loose, light weight objects, such as garbage cans and garden tools.
- Get plenty of extra cash in case power goes out and ATMs do not work.
- Garage or store vehicles that are not being used.
- Follow instructions issued by local officials. **EVACUATE IMMEDIATELY IF ORDERED TO DO SO!**

Final Actions to Take if Leaving

- Turn off propane tanks.
- Unplug small appliances.
- Empty refrigerator and freezer.
- Turn off utilities if ordered to do so.
- Notify family members of your evacuation plans.
- Lower water level in swimming pool by one foot.
- Lock home securely.
- Board up remaining doors and brace garage door.
- Take pets with you.



Final Actions to Take if Staying

- Close storm shutters.
- Turn refrigerator or freezer to coldest setting and open only if necessary.
(25 pounds of dry ice will keep a 10-cubic foot freezer below freezing for 3-4 days.)
- Follow instructions from emergency managers and be prepared to turn off utilities if ordered to do so.
- Board up remaining doors, brace garage door, and remain inside. Stay away from boarded up windows.
- Take refuge in a predetermined safe room, such as an interior closet, bathroom, or hallway.
- Beware of the calm winds in the eye of the storm and do not venture outside. Some of the strongest winds may occur shortly after the eye passes.
- **DO NOT EXPECT EMERGENCY RESPONDERS TO BE OF ANY ASSISTANCE DURING A LANDFALLING HURRICANE!**

Hurricane Ike (2008)

Track and Intensity

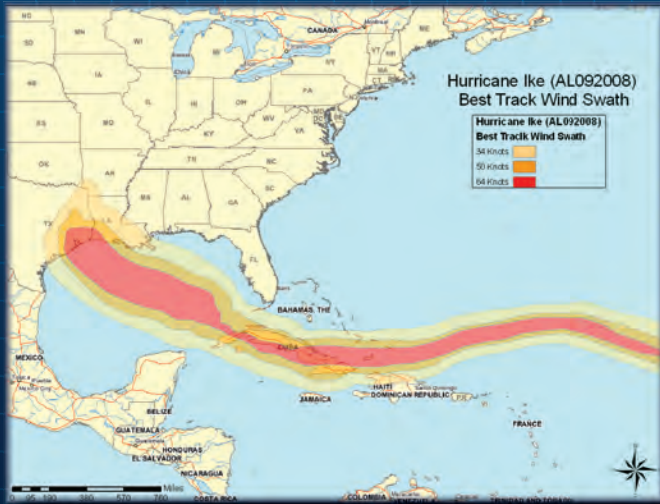


Figure 1: Track of Hurricane Ike and its associated wind field.

Hurricane Ike was a long lived tropical cyclone that originated from a well defined tropical wave which moved off of the western African coast on August 28, 2008. Bursts of convection associated with a developing area of low pressure occurred along the wave axis for the next several days; however, it was not estimated to be a tropical depression until 1:00 AM CDT on September 1st, 775 miles west of the Cape Verde Islands. The depression continued to become better organized and quickly strengthened to become tropical storm Ike later that day. Moving west-northwest, Ike continued to strengthen and became a hurricane early on the afternoon of September 3rd, when an eye became apparent on satellite imagery. Rapidly intensifying, Ike reached a maximum intensity of 145 MPH on Thursday, September 4th. A building upper level high to Ike's north induced a west and then west-southwest motion beginning on September 4th, and continuing through the 7th. During this period, Ike impacted the Turks and Caicos Islands, and moved across the island of Great Inagua. By late on the 7th (Sunday evening), Ike made the first of two landfalls along the Cuban coast near Cabo Lucrecia with maximum winds around 130 MPH. After moving off and paralleling the Cuban coastline, Ike made a second landfall near the city of San Cristóbal. Just prior to crossing the northwest tip of Cuba as a category one hurricane, with winds close to 80 MPH, Ike began producing tropical storm force winds across portions of the Florida Keys on Tuesday morning, September 9th. Fortunately for the Keys, Ike only delivered a glancing blow, as the hurricane continued to move west-northwest toward the U.S. Gulf coast.

Although Ike's interaction with Cuba disrupted the inner core of the hurricane and prevented rapid strengthening over the warm waters of the Gulf of Mexico, Ike did quickly grow in size with tropical storm and hurricane force winds stretching 275 miles and 115 miles from the center, respectively. Ike did slowly intensify to a category two hurricane with maximum winds of 100 mph by Wednesday evening, September 10. On Thursday, September 11, Ike began to move due northwest toward the upper Texas coastline. Although Ike's intensity remained in the category two range, the hurricane maintained its very large size and intensified as a 45 mile diameter eye formed as the hurricane approached the upper Texas coast late on Friday, September 12. Ike made landfall at 2:00 am CDT Saturday, September 13, near Galveston, Texas, with maximum sustained winds of 110 mph. Once inland, Ike moved north-northwest just east of Interstate 45 and brought hurricane force winds to most of southeast Texas (Figure 1).

Part of this summary includes information from the Tropical Cyclone Report: Hurricane Ike by Robbie Berg from the National Hurricane Center. The images in Figures 2a, 2b, and 2c are courtesy of the Hurricane Research Division.

Hurricane Ike (2008)

Size and Surge

For residents of southeast Texas, Ike will forever be remembered for its large size and significant storm surge. Although just under the wind speed criteria for a major hurricane (115 MPH or greater), Ike produced the greatest storm surge along the Texas coast since hurricane Carla (Category four) made landfall near Port Lavaca in 1961. Interestingly, although Ike was considerably weaker than Carla as far as maximum wind speeds are concerned, the tropical cyclone did have a larger area of hurricane force winds at landfall and a comparable tropical storm force wind field. Therefore, from a total energy standpoint, Ike was very similar to Carla; and, that explains why the magnitude of the surge events was similar. Ike produced a greater storm surge than that produced by hurricane Alicia (1983), which was southeast Texas' last major landfalling hurricane. Ike was approximately four times larger than Alicia when comparing the size of the hurricane force wind fields. See Figure 2a, 2b, and 2c for a size comparison of these tropical cyclones' wind fields near landfall.

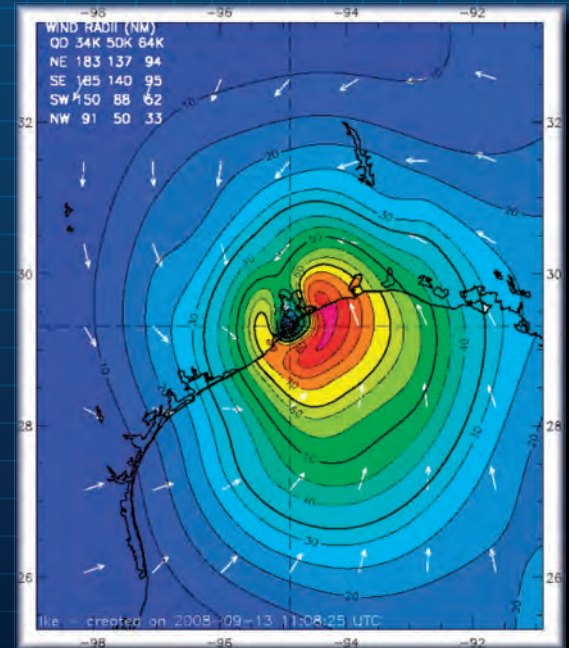


Figure 2a: Maximum 1-minute sustained wind speeds associated with Hurricane Ike on September 13, 2008

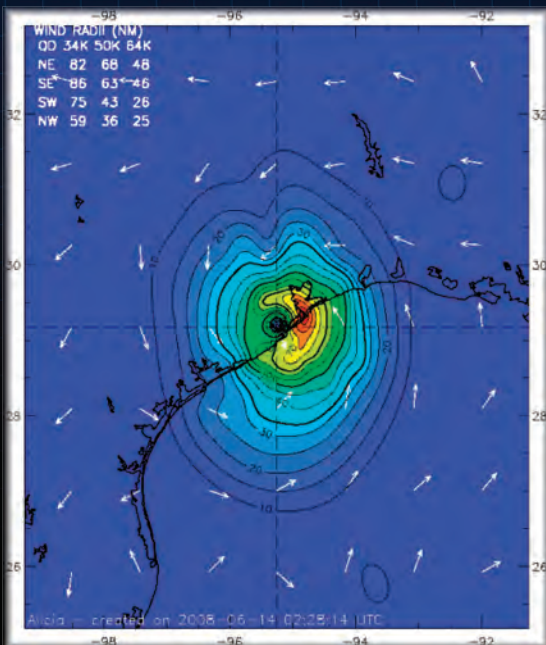


Figure 2b: Maximum 1-minute sustained wind speeds associated with Hurricane Alicia on August 18, 1983

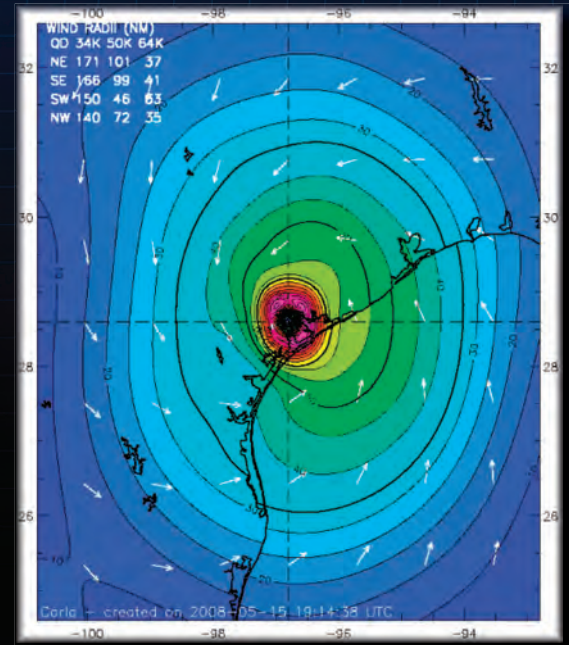


Figure 2c: Maximum 1-minute sustained wind speeds associated with Hurricane Carla on September 12, 1961

Hurricane History

- **Hurricane Ike: September 12-13, 2008.** Very large category two hurricane that made landfall at Galveston Texas. Hurricane force winds were recorded over most of Southeast Texas. However, Ike will be remembered for the record storm surge values (NAVD 88) from 14 feet near Sabine Pass with 11 to 12 feet across Sabine Lake, flooding portions of Bridge City and Orange. Port Arthur was spared the storm surge thanks to its 14-17 foot seawall. However, the remaining southern half of Jefferson county was inundated, with estimated high water marks reaching 18 to just over 19 feet to the south and east of High Island. This is the worst storm surge flooding recorded across this region during the last 150+ years of record keeping.

- **Hurricane Humberto: September 12-13, 2007.** Very small category one hurricane that made landfall between High Island and Sea Rim State Park in Jefferson county, Texas. Due to the small size, storm surge values were 4 to 5 feet across Jefferson county, 3 to 4 feet across Sabine Lake.



Above: The graphic above shows the center of every tropical cyclone moving through Jefferson County since 1851. Please note that tropical cyclones can affect regions hundreds of miles away from the center landfall.

- **Hurricane Rita: September 23-24, 2005.** Very large category three hurricane that made landfall between Johnson's Bayou and Sabine Pass, affecting the entire Louisiana and Southeast Texas coasts. Hurricane force winds were recorded from Jasper, Kountze, and High Island, Texas eastward into Louisiana. Storm surge values 8 to 10 feet (NAVD 88) across eastern Jefferson and Orange counties in Southeast Texas
- **Tropical Storm Frances: September 9-12, 1998.** Very large tropical storm that made landfall across the Central Texas coast, but the circulation covering the entire northwestern Gulf of Mexico. Every road in Sabine Pass was under water, except Highway 87 right in front of the school. Highway 87 flooded south of Port Arthur to Sabine Pass, and north of Port Arthur to Bridge City. Many locations further inland across western Jefferson county was also under water. The extensive flooding was due to tides running between 3½ to near 5 feet for 2½ days.
- **Hurricane Chantal: August 1, 1989, Hurricane Jerry: October 15, 1989.** Very small category one hurricanes that made landfall at High Island and Galveston respectively. Storm surge values were 4-5 feet across Jefferson County.
- **Hurricane Bonnie: June 26, 1986.** Very small category one hurricane that made landfall between High Island and Sea Rim State Park in Jefferson County. Storm surge values were 6-7 feet across Jefferson county
- **Hurricane Alicia: August 17-18, 1983.** Small Category three hurricane that made landfall across the Upper Texas coast just southwest of Galveston near Freeport. Storm surge values were just over 5 feet at Sabine Pass with higher values likely across Coastal Western Jefferson county.
- **Hurricane Carla: September 10-12, 1961.** Extremely large category four hurricane (circulation covered the entire Gulf of Mexico at one point) made landfall across the Central Texas coast. Due to the large size of the storm, storm surge values of 7 to 8 feet were common across coastal Jefferson and Orange Counties.
- **Hurricane Audrey: June 26-27, 1957.** Very large category four hurricane, with a 40 mile wide eye, made landfall from Sabine Pass to Cameron. Audrey affected the entire Louisiana and Southeast Texas coasts. Storm surge values of 8 to 10 feet were recorded across Eastern Jefferson and Orange Counties in Southeast Texas.

College Student Preparation

Student Information Checklist

- Assure that all contact information and emergency contact information is accurate with your campus's registrar's office.
- If your campus offers an emergency management communication system, register as a user of the system.
- Plan your method of evacuation and your destination before a storm enters the gulf.
- Monitor local radio and TV stations for updates.
- Contact your campus Student Affairs Office if you need assistance with evacuation.
- If you require any assistance due to a disability-related accommodation, please contact your campus Disability Services Office to make necessary arrangements.
- Communicate with your family regarding status and location
- If your campus is evacuating, you will not be allowed to remain on-campus and it is highly recommended that you leave the city. Do not go to a coastal location.
- Take your driver's license, student I.D. card, and a copy of your housing lease as well as medical insurance cards and other important documents when you evacuate.
- If you bank with a local bank or credit union whose infrastructure may be damaged by the storm, withdraw some funds as you may not have access to them once you leave the area.
- International students must take passports with US student visa inside, I-20, I-94, student I.D. and class schedule.
- If using personal transportation, take as many of your valuable or irreplaceable items as you are able.
- If driving, make sure all roads that you are driving are open and safe. You can call the Department of Transportation at 1-800-452-9292 or check on-line for conditions at www.txdot.gov
- Follow baggage limits if participating in an assisted evacuation program.
- Take a 30-day supply of medications in original pharmacy containers.
- Make a record of any valuables left behind (description, serial numbers, etc). Take pictures of all belongings.
- If you are evacuating to a shelter, make appropriate arrangements for pets. Most shelters do not accept pets.
- Do not plan to return to campus until an all-clear is given (monitor media and campus web-site).



Preparing Your Room

- | | |
|---|--|
| <input checked="" type="checkbox"/> Unplug all electronics and cover them in plastic | <input checked="" type="checkbox"/> Empty refrigerator |
| <input checked="" type="checkbox"/> Shut and lock your window and close your blinds | <input checked="" type="checkbox"/> Take valuables |
| <input checked="" type="checkbox"/> Store items off the floor and away from windows | |
| <input checked="" type="checkbox"/> Take all items off balconies and out of yards | |
| <input checked="" type="checkbox"/> Follow any additional instructions by your landlord | |



Evacuation

Evacuees need to consider the projected path of the hurricane when choosing an evacuation route and destination. Evacuation studies estimate that it takes around 30 hours to evacuate the Golden Triangle region in advance of tropical storm force winds. This underscores the need for coastal residents to have an evacuation plan. When evacuating, be sure to check local weather and highway conditions before departing. When local authorities order an evacuation of your area, leave immediately!

When evacuating, you need to choose a route that takes you away from the coast and not parallel to the coastline. The main evacuation route away from Sabine Pass and Port Arthur will be State Highway 87 to US Highway 69/287 to 96.

For the remainder of the Golden Triangle, many routes are possible as illustrated in the next page. These routes include but not limited to: State Highways 87, 62, 105 and US Highways 96, 69/287, and 90.



Texas Road Information

TXDOT Road Conditions

1-800-452-9292 or www.txdot.gov

TXDOT Offices

Beaumont:	1-409-924-6521
Port Arthur:	1-409-722-6521
Orange:	1-409-883-3476
Jasper:	1-409-384-9096

Emergency Broadcast Information

KQXY 94.1 FM

KLVI 560 AM

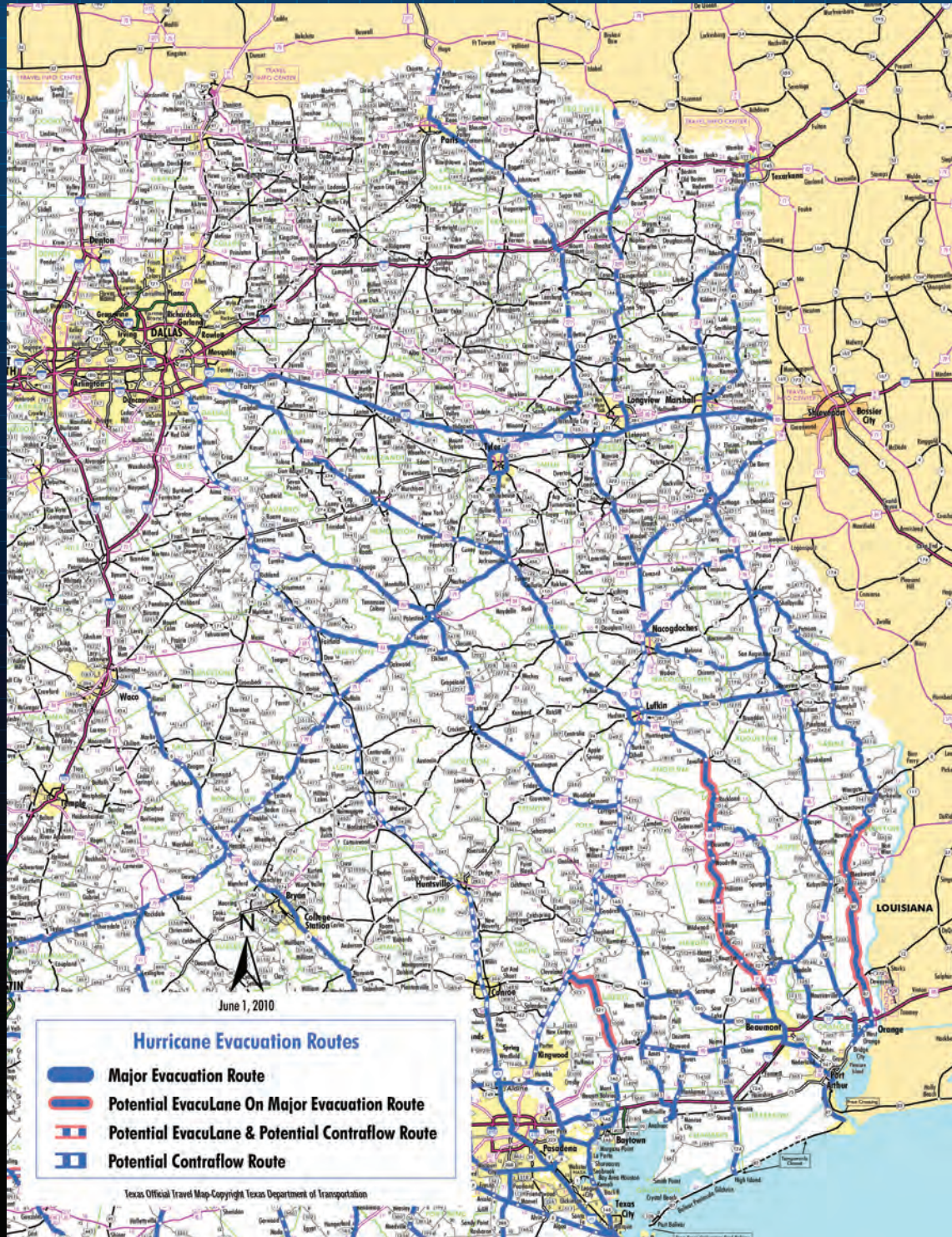


Final Actions before Evacuating

- Follow evacuation orders provided by your local officials. Once the evacuation order has been given, LEAVE IMMEDIATELY!
- Take your Hurricane Supply Kit with you (as described on page 15).
- Leave as early as possible to avoid heavy traffic and hazardous weather.
- See TXDOT map on the next page for an illustration of primary and alternate evacuation routes. Remember that the primary routes often become congested quickly.
- Do not stay in a mobile home near the coast under any circumstance.
- Remember that large boats and travel trailers may not be allowed to cross tall bridges such as the Rainbow Bridge once high winds commence.
- Prepare to stay at your evacuation destination for a week or more, as re-entry into the affected area may be restricted.

Evacuation

Suggested Evacuation Routes



TXDOT will have courtesy patrols along hurricane evacuation routes to assist motorists



National Weather Service Lake Charles, LA

www.weather.gov/lakecharles
(337) 477-5285



National Weather Service Weather Forecast Office

Lake Charles, LA

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- Marine Weather

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Click on the map below for the latest forecast.



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There are no watches, warnings, or advisories at this time.

Last map update: Mon, Feb. 8, 2010 at 10:09:51 am CST

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500 Airport Boulevard
Lake Charles, LA 70607
(337) 477-5285
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Emergency Information

NATIONAL WEATHER SERVICE LAKE CHARLES

● 337-477-5285 www.weather.gov/lakecharles

NATIONAL FLOOD INSURANCE PROGRAM

● 888-379-9531 www.floodsmart.gov

NOAA EXTREME WEATHER INFORMATION SHEETS

● TEXAS: www.ncdc.noaa.gov/files.TX.pdf

NATIONAL HURRICANE CENTER

● www.nhc.noaa.gov

FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA)

● 800-621-FEMA www.fema.gov



**Community Resource Information:
Do Not Call 911 for Non-Emergencies!**



TEXAS GOVERNOR'S DIVISION OF EMERGENCY MANAGEMENT

● 512-424-2138 www.txdps.state.tx.us/dem/index.htm

TEXAS ROAD CONDITIONS

● 800-452-9292 http://apps.dot.state.tx.us/travel/road_conditions2.htm

AMERICAN RED CROSS - BEAUMONT CHAPTER

● 409-832-1644 www.redcrossbeaumont.org

AMERICAN RED CROSS - ORANGE CHAPTER

● 409-883-2322 www.redcrossorange.org

Texas County Contacts

JEFFERSON

● 409-835-5787 www.co.jefferson.tx.us/em.htm

ORANGE

● 409-882-7895 www.co.orange.tx.us/Emergency%20Management/EM%20Website/OEM.htm

JASPER

● 409-994-2543 www.co.jasper.tx.us/ips/cms/othercountyoffices/emergencyManagement.html

NEWTON

● 409-379-5691 www.co.newton.tx.us/ips/cms/othercountyoffices/emergencyManagement.html

TYLER

● 409-283-5411 www.co.tyler.tx.us/ips/cms/othercountyoffices/emergencyManagment.html

HARDIN

● 409-246-5119 www.co.hardin.tx.us/ips/cms/othercountyoffices/

Returning Home



IF YOU EVACUATED THE AREA, WAIT FOR AN ALL CLEAR FROM THE CITY OR COUNTY BEFORE ATTEMPTING TO RETURN TO YOUR HOME. BE PREPARED TO SHOW PROOF OF RESIDENCE BY HAVING A COPY OF YOUR LATEST UTILITY BILL.



FEMA News Photo



Debris Cleanup

- Cities and counties will publish a schedule for debris pick-up and removal. Debris cannot be removed from private property.
- Construction materials, vegetative debris, household hazardous waste and household appliances will need to be placed into separate piles and moved to the curbside for pick-up.

FEMA News Photo



General Cleanup

- Be cautious of structural damage and downed power lines. Do not attempt to move structural supports or large pieces of debris.
- DO NOT run power generators indoors. Inhalation of carbon monoxide from the exhaust can cause death. Ensure exhaust is well ventilated.
- DO NOT use open flames indoors.
- Restrict your driving to emergency use only. Road conditions may not be safe until road debris is cleared.

FEMA News Photo



Water

- Listen for instructions regarding public water supply. Use only bottled, boiled or treated water until you know that your water supply is safe.
- You can use household chlorine bleach to treat water for drinking or cleaning. Add 1/8 teaspoon of bleach per gallon of clear water or 1/4 teaspoon of bleach per gallon if water is cloudy. Allow water to stand for 30 minutes before using.

Returning Home

Utility Cleanup

FEMA News Photo



- Check for gas leaks. If you smell or hear gas leaking, leave immediately. DO NOT use the phone or turn on lights in your home. Call the gas company from a neighbor's phone.
- Report any visible damage of power lines to the electric company. Turn off power at main breaker if any electrical equipment or circuits have been exposed to water.
- DO NOT connect generators to your home's electrical circuits. If a generator is on line when electrical service is restored, it can become a major fire hazard. Also, lineworkers working to restore power will be endangered if a generator is hooked up to the home's circuits.
- It is likely that an electric company other than your own will reconnect the lines to your home; however, they can not turn the service back on. Only your electric company can actually turn the power back on to your house.

Sewage Cleanup

- If you suspect water or sewage lines are damaged, do not use your plumbing (toilets, sinks, etc.). Contact the water company or a plumber for repairs.
- A chemical portable commode can be created by the following:
 - ✓ Use 5 gallon buckets with tight lids, lined with heavy duty plastic garbage bags.
 - ✓ Add kitty litter to the bucket as a disinfectant and deodorizer. Keep lids on firmly.
 - ✓ Keep buckets in a cool, dark place. Clean and disinfect buckets immediately.
- Your toilet can also be used by flushing until the bowl has no water. Then, line with heavy duty trash bags and disinfect with chlorine bleach after each use. Remove waste to an outside location.
- If significant sewer outages have occurred, instructions for disposal of human wastes will be announced.
- DO NOT dispose of human waste through your regular trash!

Interior Cleanup

- Disinfect and dry interior buildings and items inside. This will prevent growth of some bacteria, viruses, mold, and mildew that can cause illness.
- Clean walls, floors, and counter tops with soap and water. Disinfect them with a solution of 1 cup of bleach to 5 gallons of water.
- Wash all clothes and linens in hot water. Air dry and spray all unwashable items with disinfectant. Steam clean carpets. Throw away all items touched by water that cannot be disinfected.



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South East Texas Regional Planning Commission

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For information and referral to local resources, dial 211
If you have no means to evacuate, dial 211 to register for a ride out



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